

## IN THE CLAIMS

This listing of claims replaces all prior versions and listings of the claims in this application:

1. (Currently Amended) An isolated bacterium selected from the group consisting of *Salmonella*, *E. coli*, *Shigella*, and *Campylobacter* that has a greater than 75% reduction in hydrogenase activity relative to a wild type strain of said bacterium.

2. (Original) The isolated bacterium of claim 1 wherein the strain comprises a mutation of a NiFe hydrogenase gene, wherein the mutation disrupts the encoded NiFe hydrogenase enzyme's ability to oxidize H<sub>2</sub>.

3. (Original) The isolated bacterium of claim 2 wherein the strain comprises a mutation to each of the NiFe hydrogenase genes present in the genome of the strain, wherein the mutations prevent the expression of a functional NiFe hydrogenase protein.

4. (Original) The isolated bacterium of claim 1 wherein the strain is incapable of expressing a functional NiFe hydrogenase protein.

5. (Currently Amended) The isolated bacterium of claim [[1]] 2 wherein the bacterium is selected from the group consisting of *Salmonella*, *Helicobacter*, *E. coli*, *Shigella*, and *Campylobacter**Salmonella typhimurium*, *Salmonella typhi*, *E. coli* 0157, *Shigella flexneri*, *Shigella sonnei*, and *Campylobacter jejuni*.

6. (Currently Amended) The A composition comprising an isolated bacterium of claim 3 wherein the bacterium is selected from the group consisting of *Helicobacter hepaticus*, *Salmonella typhimurium*, *Salmonella typhi*, *E. coli* 0157, *Shigella flexneri*, *Shigella sonnei*, and *Campylobacter jejuni* wherein said bacterium has a greater than 75% reduction in hydrogenase activity relative to a wild type strain of said bacterium.

7. (Original) An antigenic composition comprising an isolated bacterium of claim 3 and a pharmaceutically acceptable carrier.

8. (Original) The antigenic composition of claim 7 further comprising an adjuvant.

9. (Canceled)

10. (Original) The antigenic composition of claim 7 in the form of a frozen or lyophilized powder.

11. (Withdrawn-Currently Amended) A method of inducing an immune response in a mammal against a pathogenic bacterium said method comprising the step of administering to said mammal a composition comprising a live bacterium, wherein the bacterium has been modified to prevent the expression of a functional NiFe hydrogenase protein of claim 6.

12. (Withdrawn) The method of claim 11 wherein the bacterium is selected from the group consisting of *Salmonella typhimurium*, *Salmonella typhi*, *Helicobacter hepaticus*, *E. coli* 0157, *Shigella flexneri*, *Shigella sonnei*, and *Campylobacter jejuni*.

13. (Withdrawn) The method of claim 12 wherein the modification comprises a mutation to each of the NiFe hydrogenase genes present in the genome of the bacterium.

14. (Withdrawn) A method of protecting a mammalian species against an infection with pathogenic *Salmonella*, *E. coli*, *Shigella*, or *Campylobacter*, said method comprising the step of administering to the subject a live bacterium, selected from the group consisting of *Salmonella*, *E. coli*, *Shigella*, and *Campylobacter*, wherein the bacterium has been modified to prevent expression of a functional NiFe hydrogenase protein.

15. (Withdrawn) The method of claim 14 wherein the live modified bacterium is administered orally at a dose of about  $10^4$  to about  $10^8$  cfu.

16. (Withdrawn) The method of claim 14 wherein the modification comprises a deletion mutation to each of the NiFe hydrogenase genes present in the genome of the bacterium.

17. (Withdrawn) The method of claim 16 wherein the mammalian species is protected from a *Salmonella* infection, said method comprising administering live *Salmonella* wherein each of the NiFe hydrogenase genes present in the genome of the bacterium has been mutated to prevent expression of a functional NiFe hydrogenase protein.

18. (New) The isolated bacterium of claim 2 wherein the bacterium is *Salmonella typhimurium*, *Salmonella typhi* or *Campylobacter jejuni*, further wherein each of the NiFe hydrogenase genes present in the bacterium has been mutated to prevent the bacterium from expressing detectable levels of NiFe hydrogenase activity.

19. (New) The isolated bacterium of claim 2 wherein said bacterium is a mutant *Salmonella typhimurium* or *Salmonella typhi* strain having comprises deletion mutations made at STM 3147, STM 1538, and STM 1786 that prevent expression of the corresponding gene products.

20. (New) The composition of claim 6 wherein one or more NiFe hydrogenase genes of said bacterium have been mutated to prevent expression of the NiFe hydrogenase gene product.

21. (New) The composition of claim 20 wherein said composition comprises the bacterium *S. typhimurium* strain (JSG 321), deposited with the American Type Cell Culture depository (10801 University Blvd, Manassas, Virginia, 20108, USA), on February 4, 2005 and assigned deposit Accession No: PTA-6556.